

ABSTRACT

Disclosed is a method of manufacturing the semiconductor devices. The method comprising the steps of forming a gate electrode on a semiconductor substrate, depositing an oxide film for a spacer on the gate electrode, implementing an anisotropic dry etch process for the oxide film for the spacer to form spacers at the sidewalls of the gate electrode, and implementing a rapid thermal annealing process for the spacers under an oxygen atmosphere in order to segregate hydrogen contained within the spacers toward the surface. Therefore, hydrogen contained within the spacer oxide film is not diffused into the tunnel oxide film and the film quality of the tunnel oxide film is thus improved. As a result, program or erase operation characteristics of the flash memory device and a retention characteristic of the flash memory device could be improved.